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Qualification tests were performed to determine whether the in-service Mk 5 Mod 1 3-Inch Cartridge Tank (Dwg 300428) could be utilized to contain properly dunnaged solid type hazardous materials weighing up to a gross weight of 15.9 kg (35 pounds). The tests were conducted in accordance with Performance Oriented Packaging (POP) requirements specified by the United Nations Recommendations on the Transportation of Dangerous Goods and the Department of Transportation's Title 49 CFR and the Final Rulings published in the Federal Register, Vol. 55 on 21 Dec 90. The tank has conformed to the POP performance requirements; i.e., the tank successfully retained its contents throughout the specified tests.

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POP Test of Mk 5 Mod 1 3-Inch Cartridge Tank

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PERFORMANCE ORIENTED PACKAGING TESTING OF TANK, CARTRIDGE, 3-INCH, MK 5 MOD 1 FOR PACKING GROUP II SOLID HAZARDOUS MATERIALS

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21 June 1991

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INTRODUCTION

The Mk 5 Mod 1 3-Inch Cartridge Tank tested, contained a simulated load of 28 pounds of sand representing the worst case of loading. Overall weight of the tank was 35 pounds. This Performance Oriented Packaging (POP) test was performed to ascertain whether this standard container (Packing Group II) would meet the requirements as specified by the United Nations Recommendation on the Transportation of Dangerous Goods Document, ST/SG/AC.10/1, Revision 6, Chapters 4 and 9. A base level vibration test was also conducted in accordance with the final rulings specified in the Department of Transportation's Performance Oriented Packaging Standards in the Federal Register Volume 55.

The objectives of these tests were to minimize the risk of personnel or environmental exposure to the hazards associated with the contents in the advent of a transportation or handling accident.

TESTS PERFORMED

1. Base Level Vibration Test

This test was performed in accordance with paragraph 178.608 of the Performance Oriented Packaging Standards, Final Ruling, published in the Federal Register, Vol. 55, No. 246, December 21, 1990. Three sample tanks were placed on the repetitive shock platform. The tanks were restrained during vibration in all but the vertical direction. The frequency of the platform was increased until the tank left the platform 1/16 of an inch at some instant during each cycle. Test time was 1 hour at a frequency of 3.83 Hz.

2. Stacking Test

This test was performed in accordance with ST/SG/AC.10/1, chapter 9, paragraph 9.7.6. Three tanks were used for this test. Each tank was subjected to a force applied to its top surface equivalent to the total weight of identical packages stacked to a height of 3 meters (including the test sample). A weight of 2,152 pounds was stacked on the three tanks (717.3 pounds/tank). The test was performed for 24 hours. After the allowed time, the weight was removed and the tanks examined.

3. Drop Test

This test was performed in accordance with ST/SG/AC.10/1, chapter 9, paragraph 9.7.3. Six tanks were used as required. The drops were performed from a height of 1.2 meters (4 feet) in the following orientations (three tanks for each orientation):

a. Horizontally.

b. Diagonally on the edge between the cover assembly and the top ring of the tank.

This test was performed at an ambient temperature of $+70 \pm 20$ °F.

PASS/FAIL (UN CRITERIA)

1. Base Level Vibration Test (HM-181 CRITERIA)

The criteria for passing the base level vibration test is outlined in paragraph 178.608 of the Title 49 CFR Final Ruling and states the following: "immediately following the period of vibration, each package shall be removed from the platform, turned on its side and observed for any evidence of leakage. Rupture or leakage from any of the packages constitutes failure of the test."

2. Stacking Test (UN CRITERIA)

The criteria for passing the drop test is outlined in paragraph 9.7.6.3 of ST/SG/AC.10/1 and states the following: "... no test sample should leak. No test sample should show any deterioration which could adversely affect transport safety or any distortion liable to reduce its strength or cause instability in stacks of packages."

3. Drop Test (UN CRITERIA)

The criteria for passing the drop test is outlined in paragraph 9.7.3.5 of ST/SG/AC.10/1 and states the following: "Where a packaging for solids undergoes a drop test and its upper face strikes the target, the test sample passes the test if the entire contents are retained by an inner packaging or inner receptacle; e.g., a plastic bag, even if the closure is no longer sift-proof. A slight discharge from the closure(s) upon impact should not be considered to be a failure of the packaging provided that no further leakage occurs."

TEST RESULTS

1. Base Level Vibration Test

Satisfactory.

2. Stacking Test

Satisfactory.

3. Drop Test

Satisfactory.

DISCUSSION

1. Base Level Vibration Test

Immediately after the vibration test was completed, each tank was removed from the platform, turned on its side and observed for any evidence of leakage. There was no leakage to the tanks as a result of this test.

2. Stacking Test

Each tank was visibly checked after the 24-hour period was over. There was no leakage, distortion, or deterioration to any of the tanks as a result of this test.

3. Drop Test

After each drop, the tanks were inspected for any damage which would be a cause for rejection. Final inspection indicated damage was minimal with only minor denting noted. The tanks remained intact and functional upon completion of the tests.

REFERENCE MATERIAL

A. United Nation's "Recommendation on the Transportation of Dangerous Goods," ST/SG/AC.10/1, Revision 6

B. Title 49 CFR 107, et al., Performance Oriented Packaging Standard; Changes to Classification, Hazard Communication, Packaging and Handling Requirements Based on UN Standards and Agency Initiative; Final Rule, Federal Register, Vol. 55, No. 246 of December 21, 1990.

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TEST DATA SHEET

DATA SHEET:	
Container: Mk 5 Mod 1 3-Inch Cartridge Tank	
Type: 1B2	**Container P/N or NSN:** NSN 8140-00-714-9119
Specification Number: Drawing 300428	**Material:** Aluminum
Gross Weight: 15.9 kg (35 pounds)	**Dimensions:** 6.35" D x 37" L
Closure (Method/Type): Removable Cover	**Tare Weight:** 3.2 kg (7 pounds)
Additional Description:	
PRODUCT: See table	
Name: See table	**NSN(s):** See table
United Nations Number: See table	
United Nations Packing Group: II	
Physical State (Solid, Liquid, or Gas): Solid	
Vapor Pressure (Liquids Only): N/A	**At 50 °C:** N/A **At 55 °C:** N/A
Consistency/Viscosity: N/A	**Density/Specific Gravity:** N/A
Amount Per Container: See table	**Flash Point:** N/A
Net Weight: See table	
TEST PRODUCT: Simulated Weights of Sand	
Name: Sand	**Physical State:** Solid
Consistency: N/A	
Density/Specific Gravity: N/A	
Test Pressure (Liquids Only): N/A	
Amount Per Container: N/A	**Net Weight:** 12.7 kg (28 pounds)

TABLE 1
Mk 5 Mod 1 3-Inch Cartridge Tank

DODIC	NSN	Type	Drawing/ Packing Document	UN Code	UN Number	#/ Cntr	Weight (lb)
C136	1315-00-555-7391	Ctg, 3"/50, VT	159241 300428 1380699/ OR-68/41	1.2E	0321	1	32
C137	1315-00-555-7426	Ctg, 3"/50, VT	*	1.2E	0321	*	*
C140	1315-00-555-7201	Ctg, 3"/50, VT	*	1.2E	0321	*	*
C141	1315-00-555-7393	Ctg, 3"/50, VT	*	1.2E	0321	*	*
C143	1315-00-039-1682	Ctg, 3"/50, AP	*	1.2E	0321	*	*
C150	1315-00-351-2751	Ctg, 3"/50, VT	*	1.2E	0321	*	*
C150	1315-00-766-3734	Ctg, 3"/50, VT	*	1.2E	0321	*	*
C151	1315-00-364-4681	Ctg, 3"/50, VT	*	1.2E	0321	*	*
C151	1315-00-766-3732	Ctg, 3"/50, VT	*	1.2E	0321	*	*
C152	1315-00-364-4664	Ctg, 3"/50, VT	*	1.2E	0321	*	*
C152	1315-00-766-3733	Ctg, 3"/50, VT	*	1.2E	0321	*	*
C153	1315-00-351-2752	Ctg, 3"/50, VT	*	1.2E	0321	*	*
C153	1315-00-766-3731	Ctg, 3"/50, VT	*	1.2E	0321	*	*
C162	1315-00-039-1571	Ctg, 3"/50, VT-NF	*	1.2G	0015	*	*
C162	1315-00-620-3505	Ctg, 3"/50, VT-NF	*	1.2G	0015	*	*
C162	1315-00-620-3507	Ctg, 3"/50, VT-NF	*	1.2G	0015	*	*
C164	1315-00-039-1660	Ctg, 3"/50, VT-NF	*	1.2G	0015	*	*
C164	1315-00-555-7161	Ctg, 3"/50, VT-NF	*	1.2G	0015	*	*
C164	1315-00-620-3509	Ctg, 3"/50, VT-NF	*	1.2G	0015	*	*
C172	1315-00-930-5830	Ctg, 3"/50, Illum	*	1.2G	0171	*	*
C178	1315-00-039-1487	Ctg, 3"/50, BL&P	*	1.2C	0328	*	*
C178	1315-00-039-1517	Ctg, 3"/50, BL&P	*	1.2C	0328	*	*
C179	1315-00-039-1499	Ctg, 3"/50, BL&P	*	1.2C	0328	*	*
C179	1315-00-039-1546	Ctg, 3"/50, BL&P	*	1.2C	0328	*	*

* Same information in first NSN applies.

TABLE 1
Mk 5 Mod 1 3-Inch Cartridge Tank

NALC	NSN	Type	Packing Drawing	UN Code	UN Number	#/ Cntr	Weight (lb)
C348	1315-00-039-1735	Ctg, 3"/50, HC	*	1.2E	0321	*	*
C205	1315-00-766-3720	Ctg, 3"/50, VT	*	1.2E	0321	*	*
C207	1315-00-294-1751	Ctg, 3"/50, VT	*	1.2E	0321	*	*
C207	1315-00-294-1752	Ctg, 3"/50, VT	*	1.2E	0321	*	*
C207	1315-00-766-3753	Ctg, 3"/50, VT	*	1.2E	0321	*	*
C208	1315-00-766-3725	Ctg, 3"/50, VT	*	1.2E	0321	*	*
C208	1315-00-767-8240	Ctg, 3"/50, VT	*	1.2E	0321	*	*
C212	1315-00-766-3747	Ctg, 3"/50, AP	*	1.2E	0321	*	*
C215	1315-00-766-3745	Ctg, 3"/50, AP	*	1.2E	0321	*	*
C218	1315-00-766-3739	Ctg, 3"/50, HC	*	1.2E	0321	*	*
C296	1315-00-294-1843	Ctg, 3"/50, HC	*	1.2E	0321	*	*
C299	1315-00-294-1725	Ctg, 3"/50, AA	*	1.2E	0321	*	*
C302	1351-00-294-2131	Ctg, 3"/50, AA	*	1.2E	0321	*	*
C305	1315-00-294-2454	Ctg, 3"/50, Illum	*	1.2G	0171	*	*
C305	1315-01-142-3062	Ctg, 3"/50, Illum	*	1.2G	0171	*	*
C306	1315-00-140-4479	Ctg, 3"/50, HE-IR	*	1.2E	0321	*	*
C306	1315-00-136-5440	Ctg, 3"/50, HE-IR	*	1.2E	0321	*	*
C306	1315-00-364-4857	Ctg, 3"/50, HE-IR	*	1.2E	0321	*	*
C306	1315-01-017-0890	Ctg, 3"/50, HE-IR	*	1.2E	0321	*	*
C307	1315-00-136-5441	Ctg, 3"/50, HE-IR	*	1.2E	0321	*	*
C307	1315-00-140-4480	Ctg, 3"/50, HE-IR	*	1.2E	0321	*	*
C307	1315-00-364-4882	Ctg, 3"/50, HE-IR	*	1.2E	0321	*	*
C319	1315-00-294-2460	Ctg, 3"/50, VT-NF	*	1.2G	0015	*	*
C319	1315-00-766-3722	Ctg, 3"/50, VT-NF	*	1.2G	0015	*	*
C320	1315-00-294-1779	Ctg, 3"/50, VT-NF	*	1.2G	0015	*	*
C320	1315-00-766-3717	Ctg, 3"/50, VT-NF	*	1.2G	0015	*	*
C321	1315-00-141-0233	Ctg, 3"/50, HE-IR	*	1.2E	0321	*	*
C321	1315-00-328-7917	Ctg, 3"/50, HE-IR	*	1.2E	0321	*	*
C322	1315-00-141-0234	Ctg, 3"/50, HE-IR	*	1.2E	0321	*	*
C322	1315-00-328-7928	Ctg, 3"/50, HE-IR	*	1.2E	0321	*	*

TABLE 1
Mk 5 Mod 1 3-Inch Cartridge Tank

NALC	NSN	Type	Packing Drawing	UN Code	UN Number	#/ Cntr	Weight (lb)
C338	1315-00-294-1611	Ctg, 3"/50, BL-T	*	1.2C	0328	*	*
C338	1315-00-766-3743	Ctg, 3"/50, BL&P	*	1.2C	0328	*	*
C338	1315-00-962-8624	Ctg, 3"/50, BL&P	*	1.2C	0328	*	*
C341	1315-00-766-3750	Ctg, 3"/50, BL-T	*	1.2C	0328	*	*
C341	1315-00-766-3752	Ctg, 3"/50, BL&P	*	1.2C	0328	*	*
C341	1315-00-962-8625	Ctg, 3"/50, BL&P	*	1.2C	0328	*	*
C347	1315-00-039-1737	Ctg, 3"/50, HC	*	1.2E	0321	*	*
C349	1315-00-328-7950	Ctg, 3"/50, HE-PD	*	1.2E	0321	*	*
C355	1315-00-294-1636	Ctg, 3"/50, VT	*	1.2E	0321	*	*
C355	1315-00-328-7943	Ctg, 3"/50, VT	*	1.2E	0321	*	*
C355	1315-00-766-3727	Ctg, 3"/50, VT	*	1.2E	0321	*	*
C356	1315-00-766-3728	Ctg, 3"/50, VT	*	1.2E	0321	*	*
C356	1315-00-766-3730	Ctg, 3"/50, VT	*	1.2E	0321	*	*
C373	1315-00-225-5345	Ctg, 3"/50, VT-NF	*	1.2G	0015	*	*
C373	1315-00-225-5347	Ctg, 3"/50, VT-NF	*	1.2G	0015	*	*
C373	1315-00-977-6207	Ctg, 3"/50, VT-NF	*	1.2G	0015	*	*
C375	1315-00-225-5346	Ctg, 3"/50, VT-NF	*	1.2G	0015	*	*
C375	1315-00-225-5348	Ctg, 3"/50, VT-NF	*	1.2G	0015	*	*
C375	1315-00-977-6208	Ctg, 3"/50, VT-NF	*	1.2G	0015	*	*
N/A	1315-01-068-2403	Ctg, 3"/50, HE SUBASSY	*	1.1E	0006	*	*
N/A	1315-01-092-1135	Ctg, 3"/50, HE SUBASSY	*	1.2D	0169	*	*
N/A	1315-01-136-3621	Ctg, 3"/50, HE SUBASSY	*	1.2E	0321	*	*
N/A	1315-01-163-3428	Ctg, 3"/50, SPOTTING SUBASSY	*	1.2G	0015	*	*
N/A	1315-01-166-0831	Ctg, 3"/50, SPOTTING SUBASSY	*	1.2G	0015	*	*

MK 5 MOD 1 3-INCH CARTRIDGE TANK
POP MARKING

UN 1B2/Y16/S/**/USA/DOD/NAD

** YEAR LAST PACKED OR MANUFACTURED

Encl (2)